

DESIGN OF A GENERIC WORKFLOW MANAGEMENT SYSTEM

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ABSTRACT

Data is a vital part in present scenario of science and business. The scientists and business people may need to import and export data from one environment to another. Hence, there is a need to automate scientific and business processes. This paper discusses the design of a Generic Workflow Management System to design and monitor repeated procedures with minimal effort. Further, it points to future directions in this respect.

KEYWORDS: Business Process Workflows, Data Management, Management, Scientific Workflows, Workflow Applications, Workflow Management Systems, Workflows

INTRODUCTION

Workflow may be defined as automated and repeatable arrangement, coordination and management of any business activity enabled by resources to process data. It is simply flow of data through a sequence of tasks that are related to a scientific or business process. The history of workflows dates back to 1921 when Frederick Taylor & Henry Gantt studied the organization of work in the context of manufacturing, which gave rise to time and motion studies, job shops and queuing systems. Eventually the study widespread from manufacturing shop floor to the office giving rise to formalized information workflows. The term workflow may be used differently in different contexts but the basic concept remains the same. For example, in machine shops, the flow of a part through the various processing stations is a workflow. Another example of workflows is a purchase order that moves through various departments for authorization and eventual purchase. Basically, workflows enable organizations to manage their business processes consistently by attaching some business logic to their documents. Business logic defines the set of rules that guides the flow of document within the organization. A workflow can be in any mode, starting from draft mode to final published mode, as depicted in Fig. 1. Many intermediate steps are involved from inquiry to final delivery of business processes. Simple processes may involve less steps while large processes may span multiple steps. Management of such varied variety of processes can be tedious. Workflows act as central controller in such scenarios to simplify data management and storage.



Figure 1: Workflow Modes

Certain automators come with operating systems to automate repetitive, time-consuming tasks. These automators contain preinstalled automated routines for performing certain tasks. String of such routines comprises Workflow.

WORKFLOW COMPONENTS

A workflow is basically a set of steps where each step represents an activity. These activities are the building blocks of workflows. A basic workflow can be represented diagrammatically using directed flows between processing steps as depicted in Fig. 2. Different components can be integrated only if output of one previous component is equal to the input requirements of the following component.

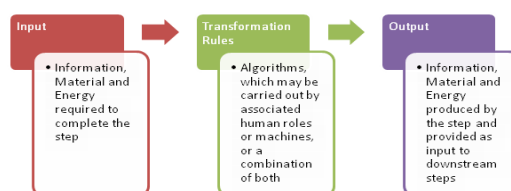


Figure 2: A Typical Processing Step in Workflows

WORKFLOW MANAGEMENT SYSTEMS

A Workflow Management System (WfMS) is a software tool for automating business processes. These processes are represented by a defined sequence of tasks, arranged as a workflow. WfMS allows users to define and set-up different workflows for different types of processes. Automated workflows result in reduction of paper work, faster access to the entire contents, eradication of data redundancy, cost saving, proper authorization and security, online access to the system, easy and durable storage, ease in the process of handling accounts like bill payments and receipts, capability of the software to maintain all kinds of details, etc.

For example, a leave application of an employee in an organization might be automatically routed through the supervisor to HR. A typical leave workflow is depicted in Fig. 3. At each stage in the workflow, an individual or a group is responsible for a specific task. Once the task is completed, the system ensures that the individuals responsible for the next task are well intimated and receive data required for taking necessary action at their end.

Workflows allow content to be created and moved through a set of pre-defined steps. These steps can be easily created and configured using Workflow Management Systems. Workflow can be as simple as two step create and approve process or it can be configured to have several steps that must be completed before final termination.

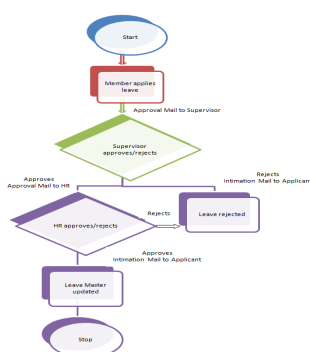


Figure 3: Leave Workflow

Pegasus was one such tool developed to map complex scientific workflows into discrete steps. It allows users to

represent workflows at an abstract level without worrying about the particulars of target execution systems. Kepler was another such tool developed for capturing scientific workflows. Scientific workflows are different from business process workflows in a sense that the former operate on large, complex and heterogeneous data. Taverna was another such tool used to construct bioinformatics workflows to perform a range of analyses, such as sequence analysis.

WfMS also allow monitoring and control of workflows and follow-up of uncompleted tasks. The intimation, monitoring and follow-up may be done through emails or SMS. Reports in WfMS provide the user with entire picture of the workflow along with performance metrics. Based on these reports, the user can decide upon which processes are in place, which one is slowing down and which one needs more attention.

There can be certain exceptions to the normal process flow which are automatically taken care by the system itself. For example, leave requests of managers may be auto-approved at manager end instead of approvals at two different levels, i.e., manager's manager and head of department, which are eventually the same. There may be a case that two or more approvals are at the same level. For example, after HOD's approval, the leave request can be sent simultaneously to HR Head and Accounts Head. Now the request will go to the next level only when both HR Head and Accounts Head have taken necessary action. Also, either of the two can act before the other. In other words, the approvals at same level are simultaneous but independent of each other. The system ensures that the request goes to the next level only when all the approvals at current level have been done failing which it will not be shown at the next level.

Microsoft provides tools to create custom workflows that manage the life cycle of documents. Workflows can be created and configured in SharePoint 2010, using Microsoft Visual Studio 2010, SharePoint Designer 2010 and Visio 2010. There are certain options and settings which can be changed by the user, e.g., to start the workflow manually or automatically or for how much time the workflow history will be visible after it is completed.

WORKFLOW APPLICATIONS

Workflow applications are the software systems to automate workflows in particular domain. Workflows help people in organizations to collaborate and manage tasks in a simpler way. Hence, those involved can concentrate on their work rather than managing workflows. Workflow applications can be designed and developed using a graphical designer, a programming language, or a combination of the two. While the technical people can cope-up with programming languages, specialized graphical designers are particularly aimed at non-technical people.

A GENERIC WORKFLOW MANAGEMENT SYSTEM

A generic approval workflow was designed to automate the frequently occurring tasks. It provides a user friendly environment in which user can put their requests for any kind of approval. The application has been divided into different modules as shown in Figure 4:

- Masters – to define and assign roles and generate master data
- Admin – to define workflows
- Transactions – to initiate workflows
- Awaiting Your Action – workflows awaiting for review
- Reports – to display the current status of workflows

Masters Admin Transactions Awaiting Your Action Reports						
Define Workflow				WFs marked green are released		
Sr.No.	Description	Status	Released	Select		
	<input type="text"/>	Select...	No	Add Cancel		
1.	No Dues Form	Active	Yes	Edit	Define Screen	Define Task
2.	Test	Active	No	Edit	Define Screen	Define Task
3.	Issuance of Stamps	Active	No	Edit	Define Screen	Define Task
4.	Issuance of Rubber stamp	Active	No	Edit	Define Screen	Define Task
5.	Payment to Consultants	Active	Yes	Edit	Define Screen	Define Task
6.	Reimbursement of On Duty Expenses	Active	Yes	Edit	Define Screen	Define Task
7.	Delete	Active	No	Edit	Define Screen	Define Task
8.	Reimbursement of Relocation/Transfer Expenses	Active	Yes	Edit	Define Screen	Define Task
9.	Domestic supply agreement	Active	Yes	Edit	Define Screen	Define Task
10.	HR certificate	Active	Yes	Edit	Define Screen	Define Task
11.	Annual Maintenance Contract	Active	Yes	Edit	Define Screen	Define Task
12.	Travel Requisition Form	Active	No	Edit	Define Screen	Define Task

Figure 4: Workflow Modules

The Workflow Management System aims to reduce the paper work by automating the process of document handling. At any point of time, the user can easily check out the current status of its request from different kinds of reports and take action accordingly. The system is secure as a user can modify the information only after proper authentication. It provides a big leap forward over the existing laborious and inefficient system of document management. Chances of errors are also eliminated to a large extent. The system is highly user friendly as appropriate messages are provided to guide the user logged in.

CONCLUSIONS

WFMS can be used for transparent planning and control of working of enterprises and organizations. In most of the organizations, employees work together as a team and share information. For this kind of collaboration, WfMS can prove to be a really beneficial, economical and easy-to-use tool in contrast to costly manual coordination in the form of meetings, emails, etc. Hence, WfMS increase productivity, improve quality and allow transparency. WfMS guide strategic management decisions which may impact the business greatly.

Workflows help organizations to adhere to consistent business processes. They improve organizational efficiency and productivity by streamlining the cost and time required to coordinate common business processes. In scientific research too, workflows can prove beneficial by automating most of data processing jobs. The offloading of highly repetitive processes to workflow management systems can help to stimulate the pace of research and overall productivity of experimentation by saving time and effort.

Workflow Management Systems will prove beneficial only if all the steps and tasks involved in workflows are properly understood and documented. An unclear or hasty understanding of the business needs of organization may lead to changes in workflow design at a later stage and eventually increase cost. Its better if the system is cloud-based and not desktop-based considering the benefits of cloud computing. The application must be capable of integrating documents just like Google Docs or Google Drive where documents are viewed embedded within the forms. For the smooth functioning of workflows, timely notifications with proper guidance about further steps to follow are a must. Follow-up of uncompleted tasks can be achieved by sending reminders to the individuals responsible for the tasks.

As business decisions rely upon the reports generated by WfMS, the reports should be self-explanatory and should be available to all levels of detail. Dashboards allow for monitoring status of different tasks in workflows in order to draw immediate attention to the critical ones. For example, color coding scheme can be used to represent status of different work orders in an organization, with green representing the on-time orders and red for overdue ones. Pre-filled forms can be a real boon to the employees heavily loaded with other work responsibilities. In workflows like leave application, columns

like name of employee, designation, date of submission, etc., are automatically filled by the system in contrast to filling them manually in conventional system.

Although the project is complete in itself but as there is always a future scope for improvement; the same applies to this software. Workflow Mobile Application can be implemented for even faster disposal of requests. Mobile or mail alerts can be added to intimate the reviewers about expiring workflows.

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